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## ON THE SYSTOLIC BLOOD-PRESSURE IN THE ARM AND LEG IN AORTIC INCOMPETENCE.

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IN a paper on "The Measurement of the Systolic Blood-Pressure in Man," Hill (with the co-operation of Flack and Holtzmann<sup>2</sup>) in 1909 pointed out that in patients with aortic regurgitation there is a marked difference between the systolic blood-pressures in the arm and leg in the recumbent position, the systolic blood-pressure being higher in the leg than in the arm. This was explained as "due to the better conduction of the great systolic wave by the leg arteries, which were maintained in a somewhat contracted state in order to secure an adequate blood supply to the brain." In a later paper (1912) Hill and Rowlands<sup>3</sup> give numerous records of the blood-pressure in aortic regurgitation both uncomplicated and when combined with mitral disease. The maximum difference between the blood-pressures in the cases of aortic regurgitation given was 153 mm. Hg, the systolic pressure in the arm being 142 and in the posterior tibial 295 mm. Hg. It was also found that by immersing the legs in hot water the systolic pressure in the legs was reduced. Hill and Rowlands believe "that the hot water acts by inducing vasodilatation of the femoral arteries and so lessening the rigidity of the wall and the conductance of the systolic waves." Hare<sup>1</sup> confirmed these results and reported a case of aortic regurgitation in which the pressure in the arm was 275 and in the leg over 350 mm. Hg. This pathognomonic difference between the systolic pressures in the arm and leg also enabled him to establish the diagnosis of aortic incompetence in a case in which the ordinary physical signs were not sufficiently definite.

Since the publication of Hill's first paper I have found this difference between the systolic blood-pressures in the arm and leg in a large number of cases of aortic regurgitation. The difference varies considerably. In a young man aged 19, who was often under observation with very free but

compensated aortic regurgitation, the maximum systolic blood-pressure in the arm was usually about 140 mm. Hg, and that in the leg 350 mm. Hg, the difference of 210 mm. being remarkable. In another man aged 23 years with compensated aortic regurgitation there was a difference of 195 mm. (arm 125, leg 320).

In cases of aortic regurgitation, in which the compensation is strained or has broken down, the difference between the arm and leg pressures is less than in cases of compensated aortic regurgitation, but is usually distinct. I have seen cases in which, as in one of Hill's cases of combined aortic and mitral disease, there was less than 20 mm. Hg difference between the leg and arm pressures. In Hill and Rowlands' paper the records of the blood-pressure show very clearly that in uncomplicated aortic regurgitation the difference between the arm and leg pressures is considerably greater than in cases of combined aortic and mitral disease. Hill and Rowlands do not comment on this point, but their results render it unnecessary to give any further records.

In aortic regurgitation of recent origin, before compensation is established, the difference between the systolic blood-pressure in the arm and leg is comparatively slight or may even be absent. A boy aged 14 was admitted to St. George's Hospital in the third week of rheumatic fever with signs of pericarditis and aortic regurgitation. The systolic blood-pressure on different days were :—

LEG.	ARM.
120	100
90	100
100	90
130	120
95	95

A man with primary infective endocarditis of the aortic valves (confirmed by necropsy), which ran its course within 6 weeks, had a waterhammer pulse but the difference between the systolic blood-pressure in the leg (140) and in the arm (120) was only 20 mm. Hg.

It is natural to compare the effect of fever with that of the application of hot water to the legs on the systolic blood-pressure in aortic regurgitation. In a boy aged 17 years with aortic and mitral regurgitation and strained compensation the average difference between the systolic blood-pressure in the arm (130 mm. Hg) and the leg (185) was 55 mm. Hg; but during some attacks of fever, the highest temperature being 101·4 F., the difference

between the blood-pressures came down to 20 mm. and on one occasion even disappeared; the systolic blood-pressure fell greatly in the leg and only slightly in the arm. In a man aged 23 years with uncomplicated aortic regurgitation the average difference between the maximum systolic pressure in the arm (135 mm. Hg) and in the leg (200) was 65 mm. Hg. On one occasion he had slight fever (100.4) and the maximum systolic pressure in the arm was then found to be 145 mm. Hg, and in the leg 160; the difference was thus reduced to 15 mm. Hg by a fall in the blood-pressure in the leg.

Incidentally it is interesting to refer to a case of compensated aortic regurgitation with attacks of paroxysmal tachycardia in a man aged 23 years. When he was in his normal condition, some days before an attack of tachycardia, the systolic blood-pressures were 150 in the arm and 210 mm. in the leg; during an attack of tachycardia, in which the pulse rate reached 190 and neither the pulse or heart sounds suggested aortic regurgitation, the systolic blood-pressures on different days of the attack were 170 in the arm, and 180 in the leg; and 130 in the arm, and 150 in the leg, or differences of only 10 and 20 mm. Two days after the end of this attack, when the pulse rate was 72, the systolic pressures in the arm and leg were 130 and 170. On another occasion there was a difference of 90 mm. Hg some days before an attack of less severe tachycardia (pulse = 170), of 30 mm. during the attack, and an average of 60 for some days after the attack.

#### CONCLUSIONS.

(1) The difference between the maximum systolic blood-pressures in the arm and leg in aortic regurgitation is most marked in uncomplicated and compensated aortic regurgitation.

(2) It is much less marked in aortic regurgitation when the compensation is failing and, as Hill's records show, in cases of combined aortic regurgitation and mitral disease.

(3) In recent aortic regurgitation before compensation is established the difference is slight or may be absent.

(4) Fever, like the application of hot water to the legs diminishes the difference between the maximum systolic pressures in the arm and leg by producing a fall in the blood-pressure in the legs.

(5) In a case of aortic regurgitation the occurrence of paroxysmal tachycardia diminished the difference between the blood-pressures in the arm and leg.

## REFERENCES.

- <sup>1</sup> HARE. *Therap. Gazette*, 1910, 3rd ser. xxvi, 457.  
<sup>2</sup> HILL (with the co-operation of MARTIN FLACK and W. HOLTZMANN) *Heart*, 1909-10, i, 73.  
<sup>3</sup> HILL AND ROWLANDS. *Heart*, 1911-12, iii, 219.